ISSN 1346-7565 Acta Phytotax. Geobot. 55 (3): 213–216 (2004)

## Short Communication

# Chromosome Numbers for Four Taxa of *Saussurea* DC. (Asteraceae) from the Nepal Himalaya

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Chromosome numbers for three taxa of *Saussurea* DC. from the Nepal Himalaya are reported here for the first time: *S. nepalensis* Spreng., *S. taraxacifolia* (Royle) DC. var. *glabrescens* K. Fujikawa & H. Ohba and *S. wernerioides* Sch. Bip. ex Hook. f. were all found to be diploid with 2*n*=32. Material of *S. obvallata* (DC.) Edgeworth, also collected from Nepal, yielded counts of 2*n*=32, corroborating previous reports for the species in other parts of its range.

Key words: chromosome number, Nepal Himalaya, *Saussurea*

*Saussurea* DC. (Asteraceae) *sensu stricto* (Raab-Straube 2003) comprises over 375 species of unarmed perennial herbs with ranges in temperate and sub-arctic regions of Eurasia and boreal North America (Bremer 1994). Thirty-six species are currently known from Nepal (Chater & Kitamura 1982, Ohba & Akiyama 1992, Jeffrey & Srivastava 1997, Grierson & Springate 2001, Fujikawa & Ohba 2002), where the genus forms a prominent component of the alpine and subnival flora to elevations of over 5,500m.

To date, chromosome counts have been published for 113 members of the genus (Fujikawa & Ohba 2003, Fujikawa *et al.* in press). However, the bulk of these reports (covering some 80 taxa) refer to species of Russia, Siberia and East Asia, with counts existing for only 17 of those found in Nepal (Fujikawa & Ohba 2003).

As part of ongoing systematic research on the Himalayan species of *Saussurea*, we examined metaphase chromosomes of four taxa collected from five localities in eastern Nepal (Table 1, Wakabayashi 1998, Fujikawa 2000, Fujikawa & Omori 2000). Actively growing shoot tips were pretreated in 0.05% colchicine solution for 3-4 hours and then fixed with Newcomer's fluid in the field. The tips were later cleaned in an alcohol series and distilled water in the lab. Meristematic tissue was isolated from the tips and soaked in a 1:1 solution of 2% pectinase and 4% cellulase for up to 3 hours at 37°C. The macerated tissue was then stained with 2% aceto-orcein for 12-15 hours and squashed. At least two individuals from each location were examined, and a minimum of three cells per preparation were counted. All voucher specimens are deposited in the herbarium at the

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TABLE 1. Chromosome numbers and voucher data for the four taxa of *Saussurea* examined in this study.

| Species | Locality | Chromosome Number (2*n*) | Voucher specimen |
|---|---|---|---|
| **Subgenus *Saussurea*** | | | |
| *S. nepalensis* | 1 Nepal: Taplejung District, Tin Pokhari - Banduke, 4080m | 32 | Tateno *et al.* 9920064 |
| | 2 Nepal: Taplejung District, Mane Bhanjyang - Jaljale Pokhari, 4010m | 32 | Omori *et al.* 9920056 |
| *S. taraxacifolia* var. *glabrescens* | 3 Nepal: Solukhumbu Distict, Tangnag - Mosom Kharka, 3830m | 32 | Wakabayashi *et al.* 9730315 |
| *S. wernerioides* | 4 Nepal: Solukhumbu District, around Khare, 4740m | 32 | Wakabayashi *et al.* 9730277 |
| **Subgenus *Amphilaena*** | | | |
| *S. obvallata* | 5 Nepal: Solukhumbu District, Tashing Dingma - Thuli Kharka, 4050m | 32 | Wakabayashi *et al.* 9730356 |

University of Tokyo (TI).

*Counts for three of the taxa examined are new:*
*Saussurea nepalensis* Spreng., 2*n*=32 (Fig. 1A & 1B).

*Saussurea nepalensis* is known from Kashmir to southeast Tibet and Bhutan and is common in Nepal. The species is very variable in leaf and stem characters throughout its range and may constitute a complex of closely related taxa. Plants from two locations were examined in this study: those from Tin Pokhari (locality 1 in Table 1) comprised mainly dwarf plants (stems to 3cm tall) with only lower rosette leaves up to 6cm in length, whereas those at Mane Bhanjyang (locality 2 in Table 1) were predominantly long-stemmed (up to 12 cm tall) with widely-spaced, spreading cauline leaves up to 16cm in length. The two populations were otherwise similar in floral characters, with an inner pappus of 16-20 filaments and 16-18 mm in length, a shorter outer pappus (10-12 mm), and involucral bracts to 16 mm in length. The longest and shortest chromosomes in the dwarf population (locality 1) measured 4.7 μm and 1.9 μm respectively (longest/shortest ratio = 2.5), whilst those in the taller population (locality 2) were 4.3 μm and 1.8 μm (longest/shortest ratio = 2.4; averages of three cells for both populations).

*Saussurea taraxacifolia* (Royle) DC. var. *glabrescens* K. Fujikawa & H. Ohba, 2*n*=32 (Fig. 1C & 1C').

Differing from the homotypic variety mainly in its glabrescent leaves, var. *glabrescens* is recorded from a few restricted localities in eastern Nepal. The longest and shortest chromosomes measured 4.4 μm and 1.9 μm respectively, giving a longest/shortest ratio of 2.3 (averages of thee cells). *Saussurea taraxacifolia* is otherwise reported from throughout the Sino-Himalayan region and has been observed as both caulous and acaulous forms.

*Saussurea wernerioides* Sch. Bip. ex Hook. f., 2*n*=32 (Fig. 1D).

This species is an acaulous dwarf known from eastern Nepal, Sikkim and Bhutan. The longest and shortest chromosomes measured 4.3μm and 1.7μm respectively, giving a longest/shortest ration of 2.5

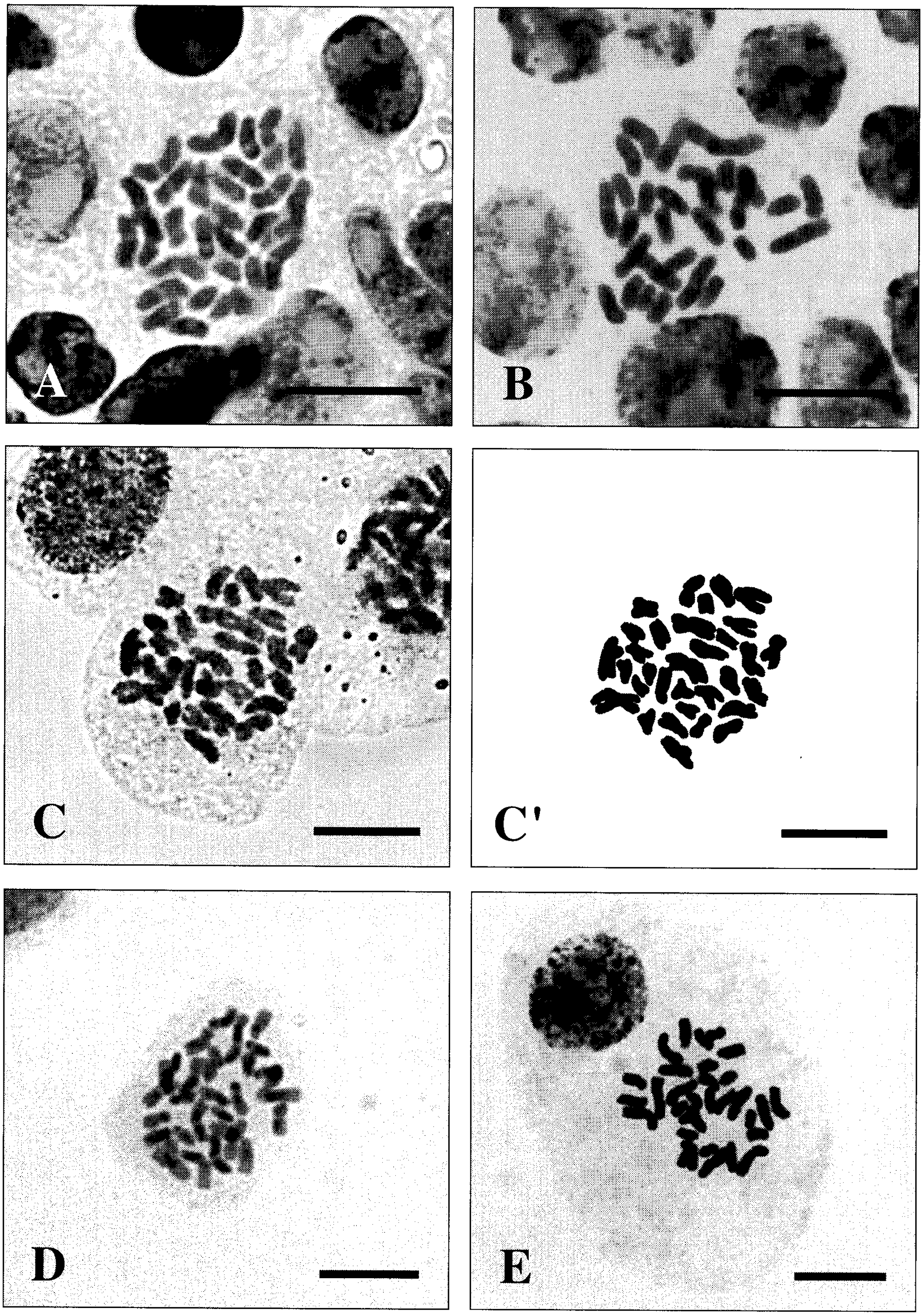

FIG. 1. Somatic metaphase cells of the four taxa of *Saussurea* examined in this study. A. *S. nepalensis* (from Tin Pokhari, locality 1 in Table 1), 2*n*=32. B. *S. nepalensis* (from Mane Bhanjyang, locality 2 in Table 1), 2*n*=32. C & C'. *S. taraxacifolia* var. *glabrescens* with diagram of same cell, 2*n*=32. D. *S. wernerioides*, 2*n*=32. E. *S. obvallata*, 2*n*=32. Scale bar=10μm.

(averages of five cells).

Counts for the fourth, *Saussurea obvallata* (DC.) Edgew. (2*n*=32, Fig. 1E), corroborate previous reports for the species sampled from other parts of its range in the Sino-Himalaya region (Shetty 1967, Gupta & Gill 1989, Gupta *et al.* 1989, Amano & Ohba 2000, Fujikawa *et al.* in press). The longest and shortest chromosomes measured 4.7μm and 1.8μm respectively (longest/shortest ratio = 2.6; averages of five cells). Although B chromosomes were not observed in the population examined here, they have been observed in Tibetan populations of the species (Fujikawa *et al.* in press).

Basic gametic numbers in the aneuploid series x=13, 14, 15, 16, 17, 18 have been reported for the genus *Saussurea* as a whole (Fujikawa & Ohba 2003 and references therein) and, as such, the four taxa examined in the present study are interpreted as diploids with basic numbers of $x$=16.

Further cytological studies on the Nepali members of *Saussurea*, particularly the remaining 16 species for which chromosome counts do not yet exist, are important for ongoing floristic work in the region. Chromosome numbers may prove useful in distinguishing between morphologically similar species, and, in combination with molecular cytogenetic techniques, could provide insights into patterns of genomic variation among the Himalayan taxa.

This study was partly supported by Grant-in-Aid for Scientific Research (A) to H.O. from the Japan Society for the Promotion of Science. Rika Okabayashi is gratefully acknowledged for her help in preparing the figures.

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*Received August 4, 2004 ; accepted October 6, 2004*